

MONTHLY WEATHER REVIEW,

JUNE, 1875.

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE

INTRODUCTION.

The present Review is compiled from data furnished by 82 regular Signal Service Observers, 12 Canadian Stations, 5 U. S. Army Surgeons, 1 Naval Hospital, 259 Volunteer Observers of the Signal Service, newspapers and other records.

The chief characteristics of the month's meteorology have been: (1) The immense masses of drift-ice and the long-continued presence of icebergs in the North Atlantic, greatly affecting the weather in all the Atlantic States. (2) The comparatively high barometer in the Gulf and South Atlantic States. (3) The low temperature in the interior of the country and the Northwest. (4) The number and violence of local storms and tornadoes west of the Alleghanies. (5) Frequent frosts north of Virginia about the middle of June, which, in some localities, were seriously felt by farmers.

ATMOSPHERIC PRESSURE.

The mean monthly distribution of pressure is exhibited on Chart No. II. The high periodic pressure of the South Atlantic and Eastern Gulf States was maintained in June as usual. The lowest pressure is in the Northwest and Upper Lake region.

(1) *Areas of high barometer*.—These have not been so well defined, nor so extended in area, as those of the preceding or colder months; but probably exceed the usual June pressures. Several of these areas, on reaching the Atlantic coast, remained nearly stationary for several days, occasioning cool southeast winds.

I. The first marked area of high barometer, of June proper, became clearly developed on the 5th, as it then descended over the Northwest, moving in a southeastward direction. This area was preceded by cold northerly winds, which produced considerable rain-fall in the Mississippi and Ohio valleys, as also, when its chilling influence was felt, in the Gulf States. In the Northwest, the barometer rose half an inch or more above its normal June reading, and the temperature sank to an unusually low figure over the Mississippi valley and the country east of it. This area gradually worked its way toward Tennessee and the Ohio valley, and finally eastward to the Middle and South Atlantic coasts, which it reached by slow degrees. On the 8th, it was accompanied by high winds near and off Cape Hatteras. It also occasioned low temperatures for the Eastern Gulf and South Atlantic States, while it remained in their vicinity.

II. On the 12th, another area of high pressure began its progress from the Northwest, but its course was directed more duly eastward over the Lakes, and thence toward the upper Ohio valley. It remained nearly central, however, over the Upper Lake region during the 12th and 13th, when it moved toward the Middle Atlantic coast, attended by low temperature.

III. Another high pressure area was reported on the afternoon of the 17th, from the Upper Lake region, whence it steadily developed in a southeastward direction, though the crest of the wave remained nearly stationary over Lake Michigan. This area finally, on the 19th, is seen in a long, narrow band running from Lake Michigan to Virginia and North Carolina, after which it ceases to be of any importance.

IV. A small area of pressure, amounting to 20 20 inches, was formed on the middle Atlantic coast on the 20th, and remained nearly stationary, producing cool, southeast winds, until the morning of the 22d. It then disappeared in a southerly quarter.

V. On the 25th, another decidedly high pressure was reported from the Eastern Gulf and south Atlantic coast, where it continued nearly stationary till the 28th

VI. On the 28th, a long area of high barometer developed in the Northwest and west of the Mississippi valley, occasioning a decided fall of temperature and considerable precipitation in its front. But the barometer readings were not very high.

VII. A seventh area of high pressure made its appearance in the Northwest on the morning of the 27th, and slowly worked eastward to the Lake region and the Ohio valley, producing cooler and cloudy weather, with considerable rain in the Ohio valley. This area was apparently but part of a more extensive one, central near Hudson's Bay, and which gradually extended on the 28th and 29th southward over New England and the Middle Atlantic coast. On the afternoon of the 27th, it occasioned a high and destructive tornado at Detroit and brisk winds generally on the Lakes. On Tuesday, the 29th, it occasioned severe local storms near Frederick, Maryland, and in southeastern Pennsylvania. This area, after reaching the Middle Atlantic States, slowly moved toward the South Atlantic coast.

VIII. During the 29th and 30th, another area of high barometer was formed in the Northwest and Lake region, reducing the temperature over the northern part of the country. As it progressed southeastwardly, its effects were very decidedly felt. But its history, &c., belong to the month of July.

(2) *Areas of low barometer.*—Only seven marked areas of low barometer were reported during the month, the barometric fluctuations having been of a more local character.

No. I. This first depression of the month appears in Nebraska on the morning of the 1st of June, accompanied by heavy rains from Omaha to Duluth. It progressed slowly during that day toward Lake Superior; and, by the afternoon of the 2d, it was central over that lake, attended by brisk northeasterly winds and rain, which extended to Lake Michigan. On the 3d and 6th it disappeared, without further noteworthy effect, north of the St. Lawrence valley.

No. II. On the morning of June 4th, a slight depression was visible in Kansas, preceded on its eastern side by cloud and occasional heavy rain. This depression, at first stationary, extended and progressed very slowly eastward during the day, and, on

the morning of the 5th, had apparently reached eastward to Indiana and Ohio. During the remainder of the latter day, it advanced rapidly to a point north of Lake Erie, and thence, on the 6th, without noticeable consequences, it passed down the St. Lawrence valley and off the coast of Maine.

No. III. First appears on Sunday, June 6th, in western Pennsylvania, where it was probably generated by the condensation and rain-fall of that day, due to the falling temperature in the northerly winds, preceding the high pressure area No. I. This depression advanced with falling barometer due east off the middle Atlantic coast, with considerable rain and fresh northwest winds in the rear, on the morning of the 7th.

No. IV. Though formed on the 9th and possibly on the 8th, was not clearly defined till the evening of the 10th, when it was central in the far Northwest. It then began to move eastwardly, with light rains, towards Lake Superior, over which it became central in the afternoon of the 11th. It was then followed by high winds in the Northwest and on the Upper Lakes, the wind velocity at Duluth reaching 36 miles per hour, at 4.35 P. M. From Lake Superior, its course continued due east towards the St. Lawrence valley, which it attained on the forenoon of the 12th, accompanied on its southern sides by considerable rain-fall. During the evening and night of the 12th, it moved off the New England coast with the usual northwest wind and cooler weather in its rear.

No decided storm-centre of any magnitude or definite cyclonic character appears on the weather maps from the 12th till the evening of the 16th, when a slight barometric depression, No. V, is seen advancing from Nebraska toward the Mississippi river. Though scarcely distinguishable, it appears to have passed eastward very rapidly on the forenoon of the 17th, and on the afternoon of that day had become traceable in the Ohio valley. At midnight of the 17th, it was central in western Pennsylvania. But, in eight hours, it had rapidly moved eastward to the Middle Atlantic coast. On the 18th, it took a somewhat northerly course and approached the coast of Maine. Although the barometer was not unusually low, while the storm was within the observation of this office, after it passed north of Cape Cod, the pressure rapidly fell, and on the morning of the 19th, very high and dangerous winds were experienced at and near Eastport, Maine, and further to the northeast. Considerable rain also fell in the rear of this gale along the New England coast. As it approached Eastport, the barometer very rapidly fell, and, subsequently, the anerometer showed the high wind-velocity of 57 miles per hour.

No. VI. On the afternoon of the 23d, a depression of minor importance began its eastward progress from the Missouri valley toward Lake Michigan, which it nearly reached on the morning of the 24th, with occasional heavy rain-fall in the upper Mississippi valley. During the latter day it advanced eastward beyond the State of Michigan, and, during the night, passed to the St. Lawrence valley, whence, on the 25th, it disappeared to the northward.

No. VII was quite rapid in its progressive motion, having first clearly appeared on the afternoon of the 26th in northern Kansas, and thence moved across Iowa and the Lake region, reaching the St. Lawrence valley and New England on the morning of the 28th. It was followed by brisk northwest winds and rain, with decidedly cooler weather.

On the 29th a slight but indefinite depression appeared in the upper Ohio valley, and slowly disappeared amidst the considerable fluctuations of pressure due to diurnal changes of temperature, without noticeable results, associated with these barometric fluctuations.

3. *Tornadoes and severe local storms* were reported from various sections. Among the most prominent of these were the storms which visited Switzerland county, Indiana, on the 2d and 21st; Wythe county, Virginia, on the 25th; St. Joseph county, Indiana, on the 1st; Hardin county, Ohio, on the 2d; Adams county, Pennsylvania, on the 29th; Indianapolis, on the 1st and 2d; Quincy, Illinois, on the 14th; St. Louis, on the 18th; Omaha, Nebraska, on the 17th; Chicago, on the 22d; Dubuque, Iowa, on the 21st; North Platte, Nebraska, on the 26th; Detroit, on the 27th; and Philadelphia, on the 28th.

The tornado at Detroit was one of great violence and destructiveness in and around that city. Its path through the city was nearly north or north-northeast. It was apparently unaccompanied by electrical phenomena. Its rate of progress was irregular, sometimes appearing to stand still, and again moving with great velocity. Its duration was estimated at from three to five minutes, the length of its track a little more than a mile, and its width about one hundred and fifty feet. The vorticoso motion was from right to left. It was first seen in the southwest as an exceedingly dark mass, with a violent whirling motion and a funnel suspended from it of the color of coal-smoke. In one or two localities it was attended by torrential rain, but generally it was a dry storm. There was considerable loss of life in its immediate vicinity; many houses were shattered beyond recognition.

This tornado was accompanied by terrific roaring, hissing and rumbling noises. It was preceded by hot and very oppressive weather for the four days previous. Three hours before its fatal stroke, it was preceded by a light shower of rain. The great outburst of the storm commenced about 6:15 p. m. of the 27th. This violent meteor was apparently not alone, but attended by others of minor importance in the immediate vicinity.

Hail storms.—A severe hail-storm was reported from Bismarck, Dakota Territory, on the 23d, with stones from one-third to one-half inch in diameter; at Troy, Alabama, on the 12th; at Mt. Ida, Arkansas, on the 20th; near Detroit on the 27th; on the 2d, at Algona, Iowa, and on the 2d, 18th, 20th and 26th, at Leroy, Kansas; at Winchester, Kentucky, on the 6th; on the 12th, at Attaway Hill, North Carolina, and at several other points.

TEMPERATURE OF THE AIR.

The mean monthly temperature of the air will, as usual, be found in isotherms on Chart No. II, and in the table in the left-hand corner.

From these exhibits it will be seen that the temperature has been nearly normal for the Atlantic and Gulf States and Lower Lake region, but has fallen below the normal by nearly 2° in the Upper Lake region, the Ohio valley and Tennessee, and the upper Mississippi and lower Missouri valleys.

The lowest temperature has occurred on the coast of Maine, and the highest in the Southwest.

Frosts occurred very generally north of Maryland on the 13th and 14th. Frost was reported on the 14th from Oswego, Rochester and Buffalo, New York, Squan Beach, New Jersey, Portland and Mt. Desert, Maine, Florida and Springfield, Massachusetts, and many points in New York and Pennsylvania; on the 15th, in Pennsylvania and Vermont; on the 16th, from New Hampshire. The frosts of the 13th and 14th were quite heavy and damaging to crops. The frosts of the 13th were specially reported from New Market, Maryland, Freehold, New Jersey, and Fall river, Massachusetts. Light frost was reported from Wayne county, Pennsylvania, as late as the 21st.

PRECIPITATION.

This element is graphically exhibited on Chart No. III. The rain-fall at San Francisco was 1.02 inches. There is a very striking excess of rain in a large irregularly-shaped belt of country, extending throughout the lower Missouri and lower Ohio valleys, and having a variable but average breath of 175 miles. Within this wide-spread region the June rain-fall has been from 8 to 12 inches. For several hundred miles around this belt the rain-fall has been in large excess. It has also been in decided excess in New England and the Lower Lake region. The deficiencies are in the Middle States, about one inch below the normal quantity, and the Upper Lake region, about .60 of an inch. But in the Western Gulf States also the deficiency (1.60 inches) is very large.

The explanation of the very large excess of rain in the Upper Mississippi, the lower Missouri and lower Ohio valleys is obvious, if we connect the abnormally low temperature (see previous article) in these sections with the prevailing southerly and vapor-laden winds. As fast as the latter could bring the moisture of the Gulf region, it has been condensed by the low temperature, producing often copious and torrential rains. On the 17th, 5.02 inches of rain fell at Omaha within eight hours. Several similar falls were reported at other stations in these sections. While somewhat destructive to railroads, these very heavy rain-storms swept millions of grasshoppers from the fields, and greatly brightened the agricultural prospects.

Rainy days.—The number of days on which rain in any quantity has fallen during the month averages about as follows: New England, 11; Middle States, Lower Lake region, and the Ohio and upper Mississippi valleys, 15; South Atlantic and Eastern Gulf States, Missouri and the lower Mississippi valleys and the Upper Lake region, 10; Texas and Indian Territory, 5.

RELATIVE HUMIDITY.

This element averages 80 per cent. for the immediate coast of New Jersey and New England and 75 per cent. on the South Atlantic coast. Elsewhere over nearly the entire country east of the western plains the average is from 65 to 70 per cent. It is, as usual, very low at the Rocky Mountain stations, being 33 per cent. at Cheyenne, 29 at Salt Lake City, and 28 at Denver.

WINDS.

The prevailing winds have been from southeast to southwest over all the country east of the Rocky Mountains. From the Ohio valley to the Gulf the direction has been nearly due south.

Total movement of the air.—The larger total movements of the air for the month have been: at Kitty Hawk, N. C., 11,048 miles; Cheyenne, 9,332; Sandy Hook, 8,479; Indianola, 8,417; Erie, 7,606; Peck's Beach, N. J., 7,963; and Squan Beach, 7,210. The smallest, at Lynchburg, 2,092; Wytheville, 2,605; Augusta, 2,611; Nashville, 3,140; Vicksburg, 3,219; Montgomery, 3,248; Morgantown, 3,352.

VERIFICATIONS.

The critical comparison of the published predictions with the weather actually following them, shows that, on the average, for all the districts predicted for, 87.5 per cent. of the predictions have been verified.

During the month 31 Cautionary Signals have been ordered at the 43 Signal Stations on the Lakes and Atlantic coasts. Of this number, 22 have been justified by the fact of succeeding high winds. There were 4 partly justified or of doubtful necessity. The remaining 5 were not justified.

NAVIGATION.

It appears that navigation was universally resumed, without ice-obstruction, before June set in on the Lakes and rivers.

The extreme depth of water in the Mississippi and its tributaries, is shown by the table on chart No. III. In the extreme upper and lower Mississippi and the upper Ohio, the lowest stage of water is seen toward the close of the month. But in the lower Missouri, it was otherwise, the water rising to its highest on the 25th, 28th, and 29th. In the central Mississippi, from Keokuk to Memphis, the highest water was recorded on the 29th and 30th.

Ice in the North Atlantic.—The ice-drift and icebergs in the North Atlantic have been, as also noticed in the last Review, unusually large and late. During the whole month of June, vessels making Canadian and American ports, were in jeopardy from ice-obstructions. In the early part of June the steamer Golden Horn, in latitude $47^{\circ} 33'$, and longitude $49^{\circ} 30'$, was detained ten days amid ice-fields and icebergs. On the 11th, the steamship State of Nevada, latitude $43^{\circ} 23'$, longitude $47^{\circ} 26'$ came in collision with a large iceberg, staving in forecastle head and damaging her plates considerably. June 24th, the steamship City of Brussels, in latitude $42^{\circ} 25'$, longitude $49^{\circ} 18'$, and on June 22d, the steamship State of Louisiana, in latitude 42° and 43° , and longitude 48° and 49° , passed large icebergs. On the 21st, the steamer Bermuda found the Straits of Belle Isle completely blocked with ice, and had to steer 175 miles to the southeast to get clear, but was still embayed in the ice for a considerable time. The steamship Scandinavian, while off the coast of Newfoundland, on the 29th of June, sighted no less than 100 icebergs, many of them of monstrous size. The steamship Caspian, which touched at St. Johns on July 1st, was five days among the icebergs, and previous to that day, steamships could not get to St. Johns on account of ice-obstructions.

TEMPERATURE OF THE WATER.

The details of water temperatures appear on the table in lower right-hand corner of Chart No. II.

The least thermometric variations in the water on the Atlantic coast are at Eastport, Maine, and Portland, Maine,— 5° to 3° respectively. The greatest range is at Wood's Hole, Massachusetts, where it is 16° . On the Lakes, the monthly range of temperature has been about 11° . In the interior rivers it has been from 9° to 12° . The greatest variation reported is 25° at Duluth.

ATMOSPHERIC ELECTRICITY.

Thunder storms.—This item is noticed in part on page 4, as many of the local storms, there recorded, were attended by electrical phenomena. Thunder storms were reported at one or more stations every day in June, except on the 9th. After the middle of the month, they became quite general over the whole country. None were reported in New England before the 7th.

Auroras.—The principal auroras were those recorded on the 3d, in New York and Pennsylvania; on the 6th, in Vermont, Massachusetts, New Hampshire and Connecticut; on the 1st, 7th, 8th and 10th, in New York; on the 2d, in Michigan; on the 4th, in New York and Iowa; on the 24th, in Wisconsin and Iowa; on the 27th, in Iowa; on the 17th, in Vermont; on the 20th, in Ohio and Pennsylvania; on the 30th, in New York and Wisconsin.

OPTICAL PHENOMENA.

(1) *Solar Halos* were less frequently observed than usual. The chief phenomena of the kind reported were as follows: on the 3d, in Kentucky; 4th, in Iowa, Nevada and New Hampshire; 5th, in Maryland, Massachusetts, New Hampshire, New York and Rhode Island; 6th, in Illinois, Massachusetts, New York and Vermont; 7th, in Iowa, Nebraska and New York; 8th, in Maryland, New York and Vermont; 9th, in Massachusetts, New Hampshire and Vermont; 10th, in New York and Pennsylvania; 11th, in New York; 13th, in Illinois; 14th, in Kansas and New York; 16th, in Tennessee; 17th, in Iowa, Kansas, New Hampshire, New York and Tennessee; 19th, in New Hampshire and Virginia; 20th, in Nevada and Ohio; 22d, in Illinois; 23d, in New York; 24th, in New Hampshire and New York; 25th, in Kansas; 30th, in Illinois.

The solar halos of the 5th were very extensively observed, and reported as quite brilliant.

(2) *Lunar Halos* were also very few in number. The principal were as follows: the 5th, Massachusetts; 7th, Colorado; 8th and 9th, New York; 11th, South Carolina; 12th, Iowa; 14th, Ohio; 15th, Pennsylvania; 17th, Ohio and Virginia.

(3) *Mirage*.—Only one mirage was noted. This was on the 7th and 19th, at Ellinwood, Kansas.

(4) A *Lunar Rainbow* was reported at Clarksville, Texas, on the 19th., and also at Buffalo, on the 24th.

MISCELLANEOUS PHENOMENA.

(1) *Natural History*.—Under this head, the following items are of note:

Grasshoppers.—At Denver, Colorado, about the middle of June, grasshoppers were reported leaving in all directions. At Leavenworth, on the 11th, they were reported flying north and northwest, and were all gone by the 13th. Grasshoppers left Iowa on the 18th. In Kansas, they were seen going northeast on the 3d, and northwest on the 12th. In Nebraska, going north from the 10th to the 17th. Millions are reported drowned by the heavy rains in the Missouri valley. Grasshoppers were very bad in New Mexico, where distressing drought also prevailed.

Locusts.—At Plattsburgh, Neb., immense swarms of locusts moved north, northeast, and northwest, from the 13th to the end of the month. The river-observer there says: "Vast quantities of locusts were seen flying over from the 15th to the 25th of June, inclusive, except the 19th, 20th and 21st. The line was from 100 to 150 miles in width and from one-quarter to one-half mile in depth. As only a few descended, no serious damage resulted." They seem to have floated along in the prevailing wind. Locusts were at Ellinwood, Kan., on the 17th.

The Colorado Beetle or Potato Bug was in large quantities in Waupaca and Waushara counties, Wis., during the month, and in Hunterdon county, N. J. It was also reported in New York.

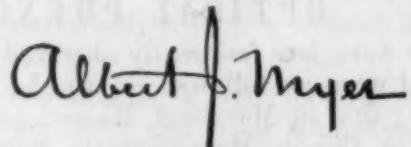
(2) *Forest Fires*.—In Dutchess county, N. Y., on the 19th; near Denver on the 18th, 24th and 25th; in St. Lawrence county, N. Y., from the 13th to 21st.

(3) *Polar Bands* at Buffalo on the 3d and 4th.

(4) *Meteors* at Albany, on the 24th; at Shreveport on the 4th and 21st; on the 21st at Lyndon, Ill.; also near Detroit, one was observed; on the 23d and 30th at New York city; brilliant one on the 24th at Trenton, N. J.; and on the 28th at Weldon, N. C.

(5) *Earthquakes*.—The ship *Hamilton*, at sea, June 4th, lat. $19^{\circ} 16' N.$, and long. $57^{\circ} 5' W.$, felt the shock of an earthquake, lasting about ten minutes, and reports that, during the time, there was a tremendous sea on the vessel, pitching her bows under. On the 18th, an earthquake, with distinct rocking and trembling motion, was felt at Indianapolis, and also at Columbus and Sandusky, Ohio; Urbana, Degraef, Vincennes, Anderson and Pickway, Indiana.

PUBLISHED BY ORDER OF THE HON. WM. W. BELKNAP, SECRETARY OF WAR.



Brig. Gen. (Bvt. Assg'd.) Chief Signal Officer, U. S. A.

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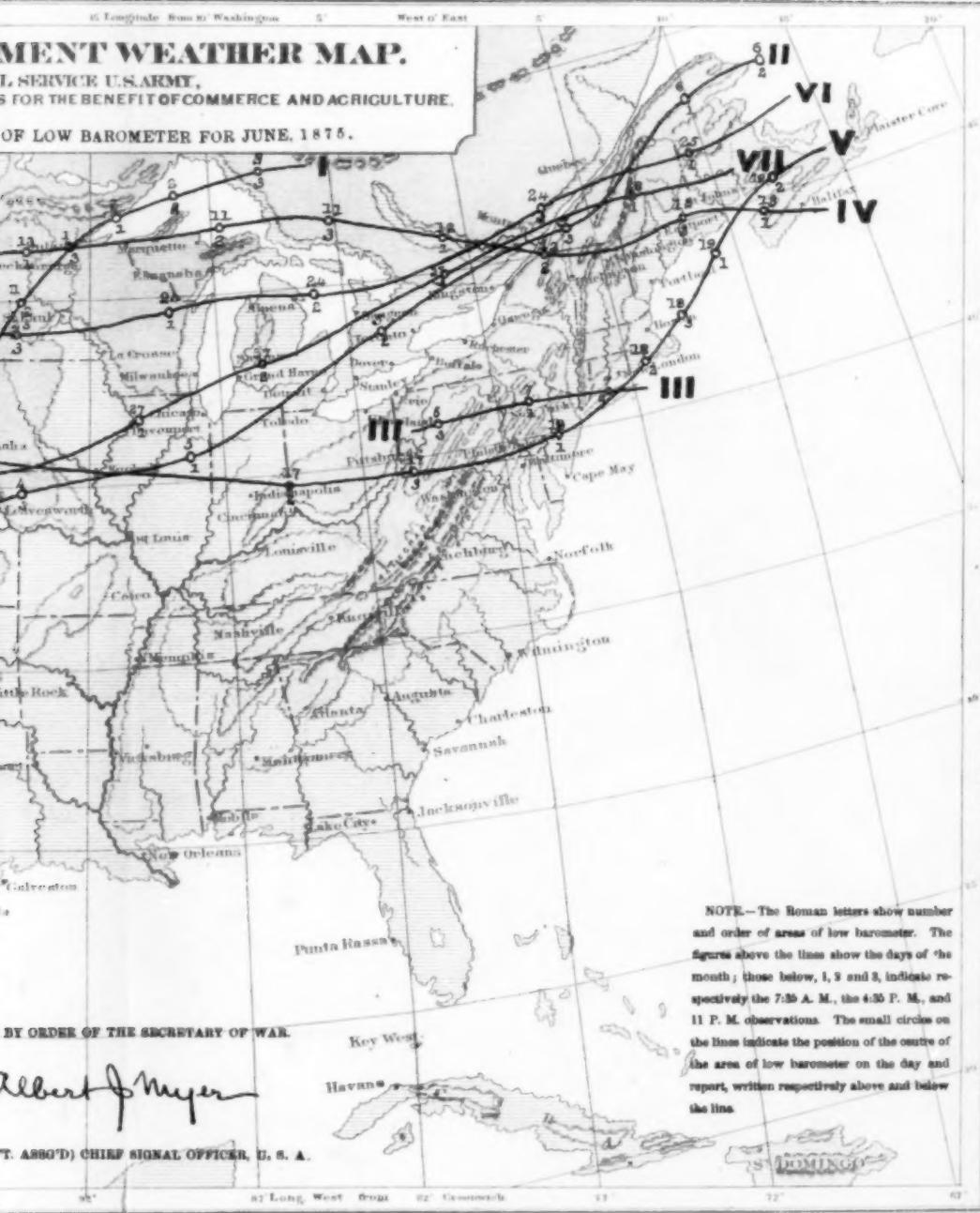
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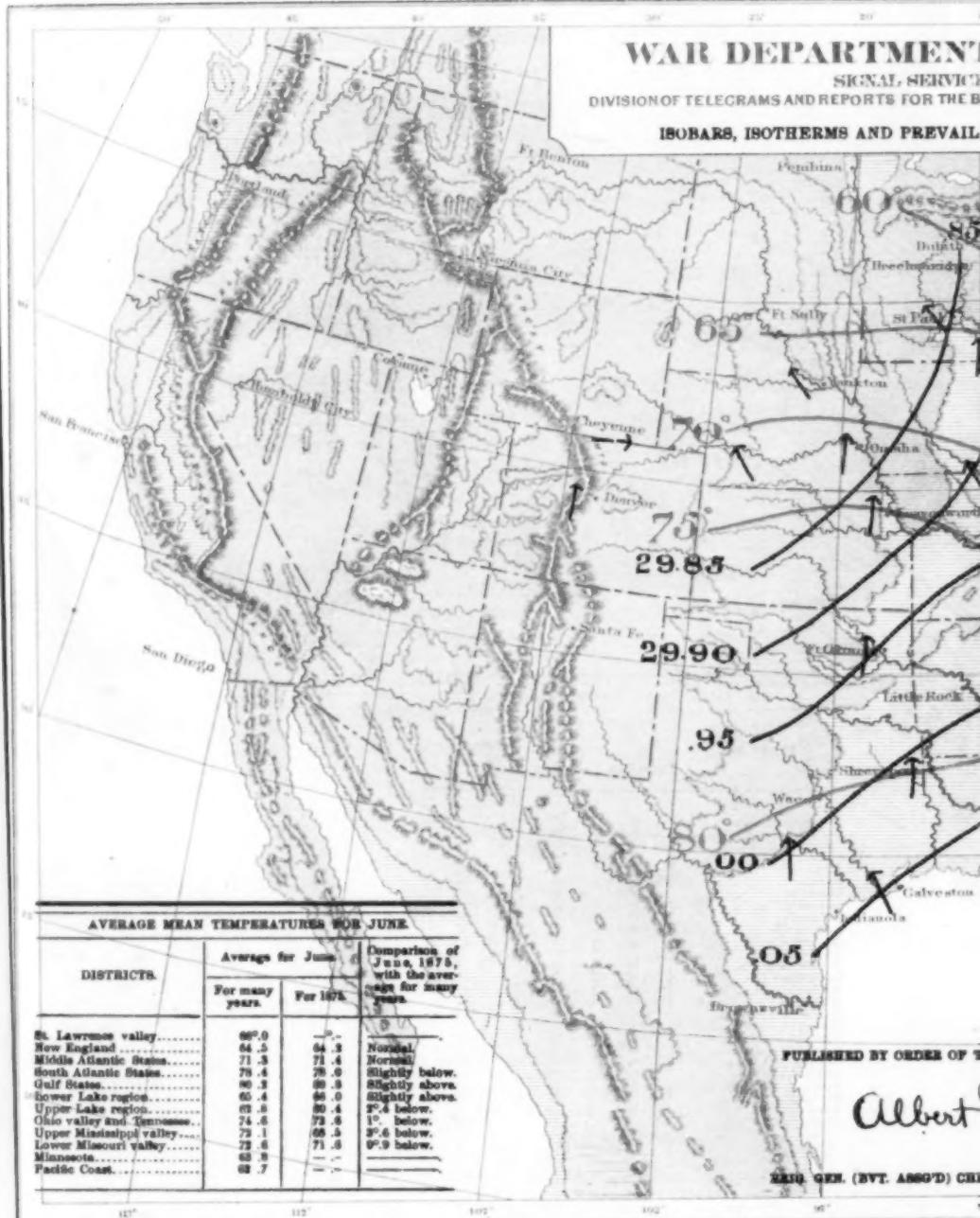
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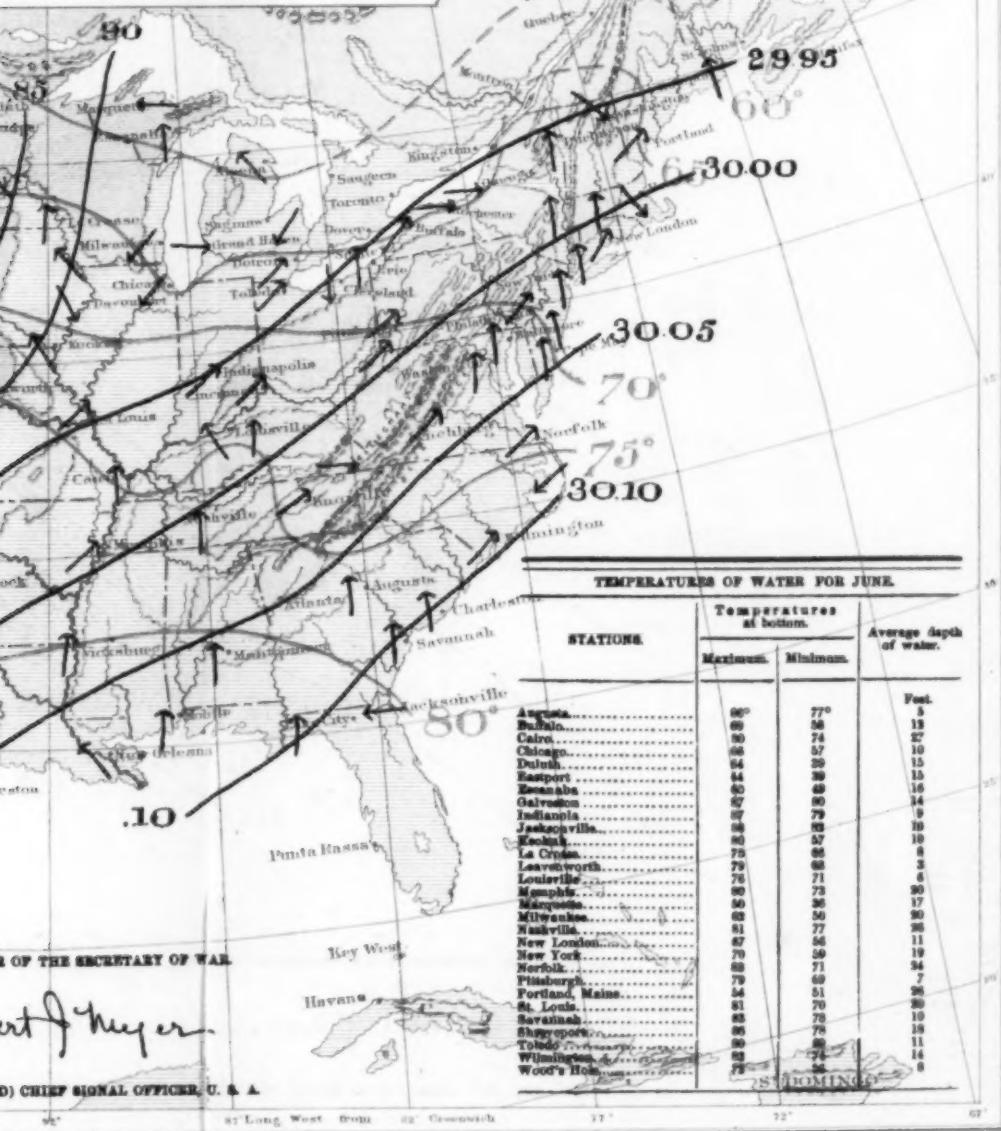
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THE BENEFIT OF COMMERCE AND AGRICULTURE.
PREDOMINANT WINDS FOR JUNE, 1875.



LETTER OF THE SECRETARY OF WAR.

sent to Meyer

CHIEF SIGNAL OFFICER, U. S. A.

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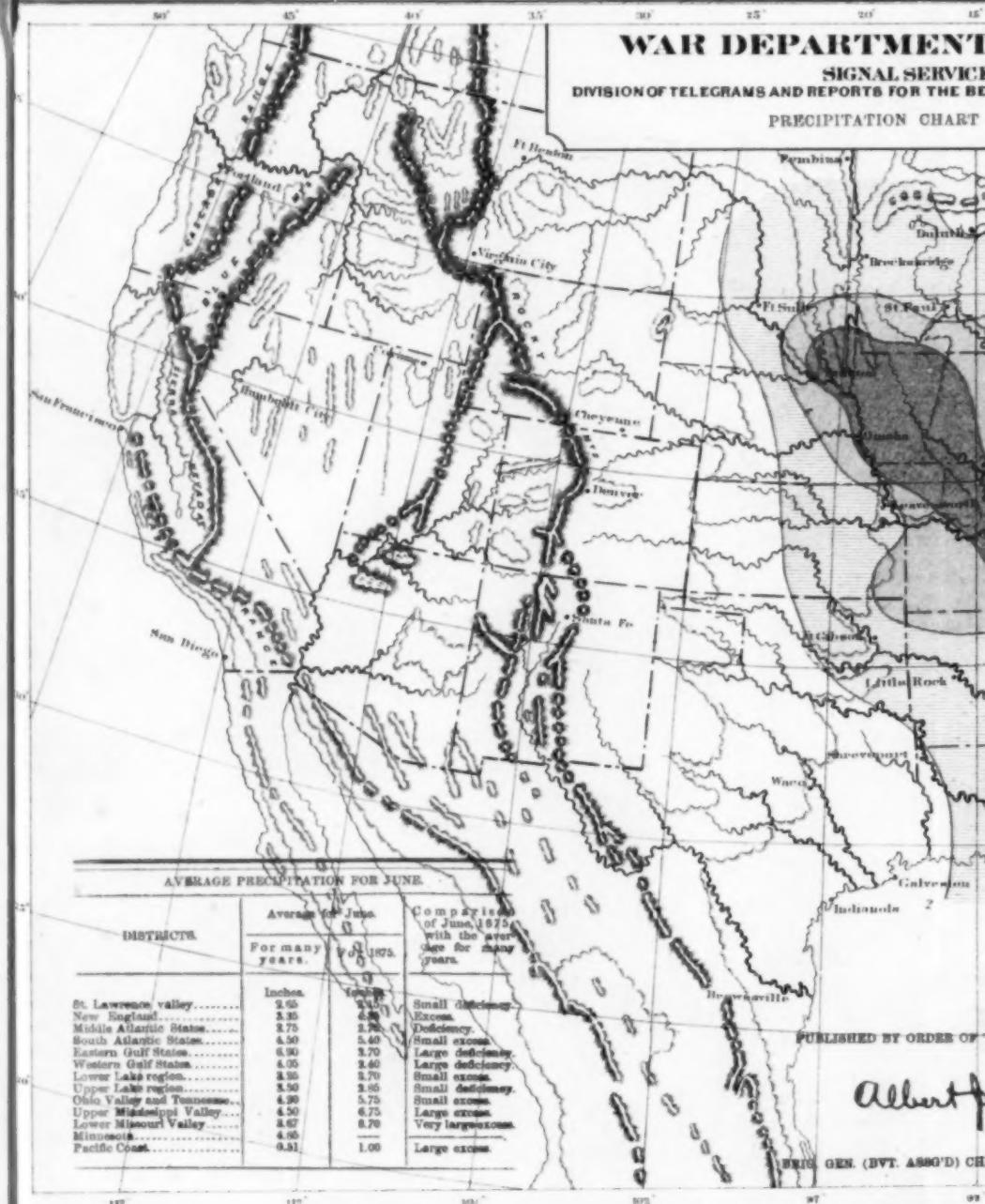
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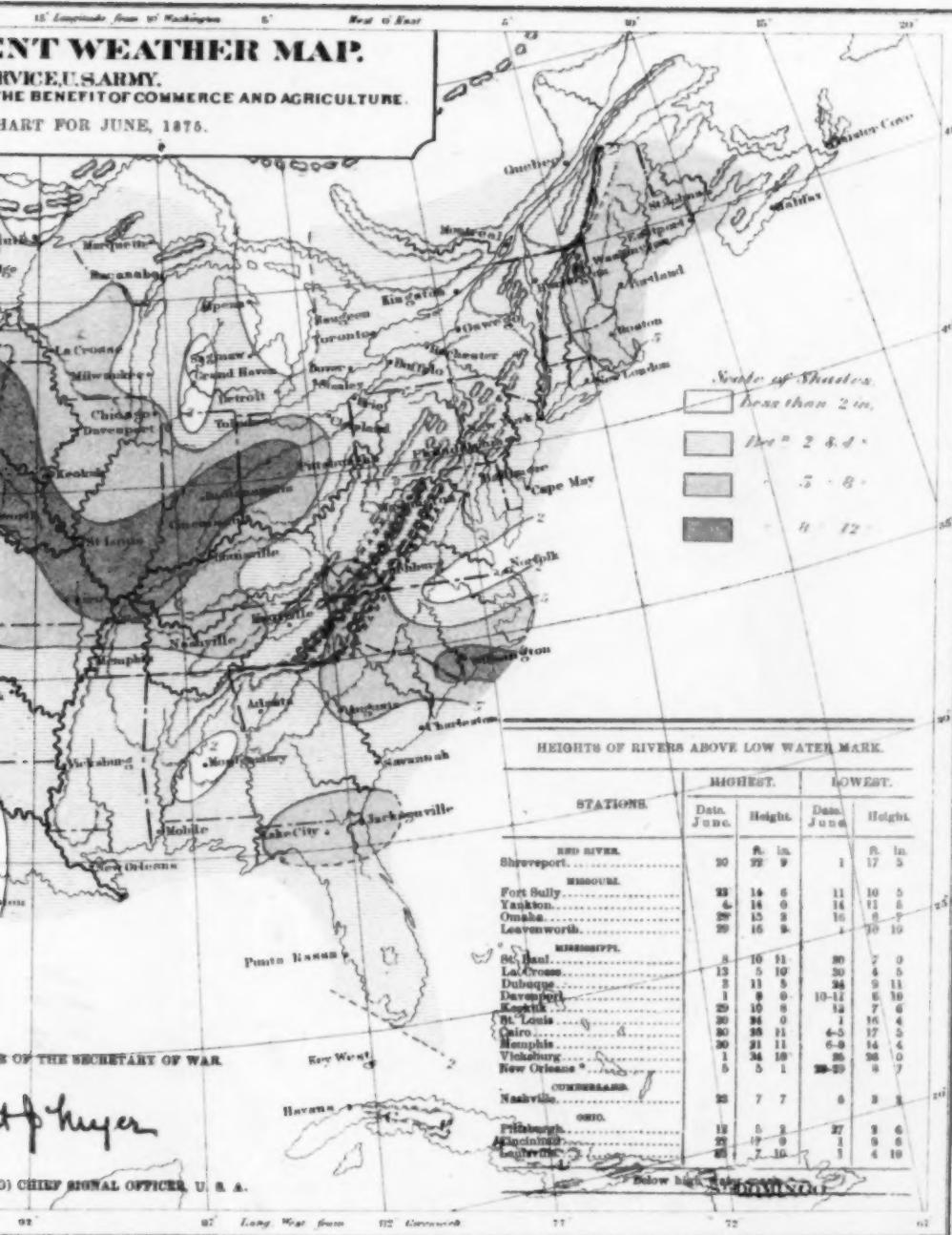
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